



EUM3006/E3K6 Functional Overview

The EUM3006 is a 900MHz radio module intended to provide connectivity between an end-user's computer and an Internet Service Provider. It is a single PCB wireless solution based on the Intersil PRISM II Direct Sequence Chip Set. The EUM3006/E3K6 is functionally identical to the EUM3006 (previously certified with FCC ID: OOX-EUM3006, IC ID: 3225B-EUM3006).

The EUM3006 is intended for mounting outdoors.

Overall functionality

The EUM3006 consists of two main sections; the digital and the RF section. Block diagrams for both sections can be found in the document "E3K6 Block Diagrams". The digital section contains the following functionality:

1. I/O
2. Ethernet PHY
3. Microprocessor/MAC
4. Memory
5. Power Regulation

The radio module's RF section contains the following functionality:

1. Baseband Processor
2. Modulator/Demodulator (with IF synthesizer)
3. RF Synthesizer
4. Up Converter
5. Power Amplifier
6. Low Noise Amplifier (LNA)
7. Down Converter
8. RF VCO
9. IF VCO
10. Reference Oscillator
11. Antenna (RF) Interface

During transmission, data obtained by the Microprocessor from the I/O ports, is transferred to the MAC. The MAC reformats the data and places it on the Baseband Processor TX data line. This data is modulated using CCK modulation and then spread using a defined PN code such that the data is sent at a rate of 2.75Mbit/s. The data is preceded by a header that uses DPSK modulation. Two signals are generated, the In-Phase (I) and Quadrature (Q) components. The I & Q signals are sent to the Modulator/Demodulator where they are first filtered and then modulated with the IF frequency (70 MHz).

The IF oscillator generates a 140 MHz signal which is divided by two inside the Modulator/Demodulator and used to modulate the I & Q signals. The final IF signal of 70 MHz is then sent to the Up converter. The Up converter will shift this signal to the RF frequency for the channel programmed in the synthesizer, for operation within the 902-928 MHz ISM band. In the final stage, this signal is amplified to produce RF power as measured at the output of the antenna port.

In receive mode, the radio signal is amplified by the LNA, and then sent to the Down converter. The Down converter converts this signal from the 902-928 MHz range to the IF frequency, 70 MHz. The Modulator/Demodulator then converts the signal to baseband and splits the signal into its I & Q components, before sending it to the Baseband Processor. Finally, the Baseband Processor despreads and demodulates the data contained in the CCK format, and places it on the RX data line to the MAC.

The MAC modifies the data, then transfers it to the Microprocessor which reformats the information and sends it out the I/O ports.

The RF and IF Local Oscillator signals are generated using the synthesizers and voltage controlled oscillators. The RF synthesizer is programmed with the desired RF channel frequency plus the IF frequency. The IF synthesizer in the Modulator/Demodulator is programmed with 140MHz. The baseband processor and the synthesizer are driven from a common 44 MHz oscillator to control the timing of these chips.

Example (for Channel 1 operation):

$$\begin{array}{ccc} \mathbf{RF} & \mathbf{IF} & \mathbf{LO} \\ 905 \text{ MHz} + 70 \text{ MHz} & = & 975 \text{ MHz} \end{array}$$

Output Power

Each EUM3006 is calibrated at 905, 915 and 925 MHz during manufacturing to output the power at the antenna connector.

The maximum time the transmitter is on is 5.1 msec after which it is in receive mode for at least 0.9 msec, so that the max. duty cycle is $5.1/6.0 = 85\%$. This duty cycle is not under the control of the user, but is inherent in the Dynamic Polled MAC used to control access to the channel.

Antennas

The EUM3006 has only one integrated antenna that is part of this certification. There is no other possibility for antennas with the EUM3006 product.

There are two criteria on the max. EIRP for a Part 15 transmitter in the 902-928 MHz range: 1) Maximum of 36 dBm EIRP and 2) Max. of 0.603 mW/cm^2 for radiation exposure. By convention, a min. distance of 20 cm has been used for indoor antennas. Applying this distance to the radiation exposure limits the EIRP to 34.8 dBm. The min. separation distance required for an EIRP of 36 dBm is 22.9 cm.

The EUM3006 uses an integrated antenna and is intended to be mounted outdoors in a permanent fixed location, where we require installers to provide at least 30 cm separation between people and the antenna.

Power Supply

The EUM3006 is powered from an AC/DC power supply, the AULT P147RB. This power supply has been tested with the EUM3006 as well as having its own FCC Class B acceptance.